

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OFFICE OF QUALITY ASSURANCE**

AUDIT REPORT M&O-ARP-98-15

OF THE

**CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM
MANAGEMENT AND OPERATING CONTRACTOR
AT**

LAS VEGAS, NEVADA

AUGUST 17 - 20, 1998

Prepared by: _____ Date: _____
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Office of Quality Assurance

Approved by: _____ Date: _____
Robert W. Clark
Acting Director
Office of Quality Assurance

1.0 EXECUTIVE SUMMARY

This performance-based Quality Assurance (QA) audit was conducted at the Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&O) Offices, Las Vegas, Nevada, August 17-20, 1998, to evaluate the System Description Document (SDD) process. The audit team determined that, with the exception of one area where a condition adverse to quality was identified, the CRWMS M&O is effectively implementing the critical process steps required for SDD development. The condition adverse to quality was determined to be identical to the conditions adverse to quality described in Deficiency Report (DR) VAMO-98-D-02. This existing DR has been revised to include the identified condition. It was determined that the SDD process is in compliance with the Quality Assurance Requirements and Description (QARD) document, DOE/RW-0333P, Revision 8. In addition, overall adequacy of and compliance to the following CRWMS M&O implementing procedures: NLP-3-33, Revision 2, *System Description Documents*; NLP-3-15, Revision 4, *To Be Determined (TBD) and To Be Verified (TBV)*; and QAP-3-0, Revision 5, *Design Control Process*, were determined to be satisfactory.

As a result of the audit, six recommendations are provided for your consideration. These recommendations are listed in Section 6.0 of this report and do not require a response.

This was the first performance based audit of the CRWMS M&O SDD development process. The audit team selected three SDD's to obtain a cross section of activities for above ground, below ground and waste package design. The SDD process is a dynamic process that will evolve commensurate with design. As a result, surveillances will be scheduled to coincide with the projected SDD development milestones to measure effectiveness of the process as it evolves.

2.0 SCOPE

The audit was conducted to evaluate the adequacy and effectiveness of the CRWMS M&O controls for the SDD development process. The audit was intended to determine the degree to which the SDD development process meets the QARD program requirements and management commitments and expectations.

Activities involving development of the SDDs were selected from the following Work Breakdown Structures (WBS):

- WBS 1.2.4.6, *Surface License Application Design (LAD), Facilities System Design*

Descriptions (SDD).

- WBS 1.2.4.7, *Subsurface LAD, Facilities SDD.*

The SDD development process was evaluated during the audit, in accordance with the approved audit plan.

2.1 Process Steps/Products/Documentation

The performance-based evaluation of process effectiveness was based upon the following:

1. Satisfactory completion of critical process steps;
2. Documentation that substantiates the quality and technical adequacy of SDD;
3. Performance of trained and qualified personnel; and
4. Implementation of applicable QA program elements.

The following critical process steps were considered during the evaluation of the SDD process:

1. Development of Criteria Basis Statements
2. Requirements flowdown
3. Selection and training of personnel
4. Selection of inputs
5. Initiation and development of Type I Analysis
6. Discipline checking
7. Review process and schedule
8. Labeling of criteria that are to be verified or to be determined
9. Comment resolution process
10. Revisions and interim changes
11. Records

2.2 Technical Areas

The audit included a technical evaluation of the adequacy and effectiveness of the SDD development process. Details of the technical evaluation are documented in Section 5.4 of this report.

3.0 AUDIT TEAM AND OBSERVERS

Name/Title/Organization

Lawrence W. McGrath	Audit Team Leader, Office of Quality Assurance (OQA)
Patrick V. Auer	Auditor, OQA
Raymond A. Mele	Technical Specialist, MTS/BAH
Mark Senderling	Observer, US DOE/RW-46
William Belke	US NRC
Kien E. Chang	US NRC

4.0 AUDIT MEETINGS AND PERSONNEL CONTACTED

A pre-audit meeting was conducted at the CRWMS M&O Offices, Las Vegas, Nevada, on August 17, 1998. Daily debriefings were held to apprise the CRWMS M&O management and staff of the progress of the audit and of any identified conditions adverse to quality. A post-audit meeting was conducted at the CRWMS M&O Offices, Las Vegas, Nevada, on August 20, 1998.

Personnel contacted during the audit, including those that attended pre-audit and post-audit meetings, are listed in Attachment 1.

5.0 SUMMARY OF RESULTS

5.1 Program Effectiveness

With the exception of the area where a condition adverse to quality was identified, the audit team concluded that critical process steps applicable to the SDD development process are effectively being implemented and meet the applicable QARD requirements.

5.2 Stop Work or Immediate Corrective Actions Taken

There were no Stop Work Orders or immediate corrective actions taken as a result of the audit.

5.3 QA Program Activities

A summary table of audit results is provided in Attachment 2. Details of the audit, including the objective evidence reviewed, are documented in the audit checklist. The checklist is maintained as a QA record.

5.4 Technical Audit Activities

Three SDDs were selected for detailed technical review. These were the Subsurface Ventilation System, (SDD Number SS05), Defense High Level Waste Disposal Container System, (SDD Number WP03), and Assembly Transfer System (SDD Number SU10). In addition, requirements and criteria were traced from a number of other Project documents to the SDDs, and the criteria identified in the SDDs were traced to engineering design analyses which are complete or in the process of development. While there were no specific conditions identified which directly impacted the development of the SDDs and their subsequent input to the Type II design analyses, improvements in the processes can be made. These are identified in Section 6.0, Recommendations.

It was recognized during the audit that CRWMS M&O SDD development and design personnel were adhering to the SDD development and design control processes, identified in NLP-3-33, *System Description Documents*; and QAP-3-0, *Design Control Process*.

Several observations for the development of the SDDs and the clarification and enhancement of the design processes were discussed with the audit team and engineering personnel. A revised design process has been implemented for the development of the License Application (LA) design. This process uses a different suite of requirements documents as the bases for the development of the SDDs and design analyses, as opposed to the suite of requirements documents used as the bases for the Viability Assessment (VA) design. Based on interviews with CRWMS M&O management and designers, it was apparent that the SDD development process and the design processes associated with the development of the LA design were being adhered to. It was noted, however, that the management of the technical processes that will produce the LA design did not appear to be adequately defined, documented, or controlled in any CRWMS M&O approved document. This resulted in audit recommendation #1. This issue

generally impacted all of the observations made during this audit, and the effective implementation of processes to address this issue should result in an enhanced design process.

Requirements flowdown and traceability were examined in several of the SDDs. Selected SDD system design criteria were evaluated against requirements in the Mined Geologic Disposal System - Requirements Document (MGDS-RD), regulatory requirements in the *Code of Federal Regulations*, Part 10CFR60, and assumptions contained in the *Controlled Design Assumptions Document* (CDA). The audit team determined that no requirements were found to be missing in the sample and it appeared that no assumptions were missing. However, there does not appear to be any comprehensive or structured method to verify that all 10CFR60 requirements or assumptions contained in the CDA will be adequately addressed as the SDDs are developed. As a result of evaluating this area of SDD development, the audit team generated two additional recommendations regarding the allocation of 10CFR60 requirements to the individual SDDs and the use of assumptions contained in the CDA as inputs to the SDDs. (See audit recommendations #2 and #3).

A sample of the development of Criteria Basis Statements in Volume II of the SDDs and the bases for these criteria were evaluated. In most instances, the audit team determined that the Criteria Need Basis and the Criteria Performance Parameter Basis were adequately stated for the current level of SDD development. It was noted that the U.S. Department of Energy (DOE) has not officially accepted several of the source documents listed as input to the Criteria and Criteria Basis Statements. This resulted in audit recommendation #4.

As the SDDs are developed, information that is not yet defined or that is preliminary or that needs to be reevaluated is marked "To Be Determined" (TBD) or "To Be Verified" (TBV). Collectively, these are referred to as "TBXs". The audit team checked how TBXs are identified, assigned, and tracked to closure. Procedure NLP-3-15, *To Be Verified (TBV) and To Be Determined (TBD) Monitoring System*, is currently used to control TBXs. However, the audit team determined that a prioritized list of TBXs that support the resolution of "Site Recommendation/License Application" (SR/LA) technical issues has not been developed. The TBXs form the basis for revisions to the SDDs. They determine the level of maturity of ongoing design efforts, considering that criteria marked with a "TBX" are not complete and may change as the TBX is resolved. Furthermore, they are the basis for general fiscal planning efforts. Based on the audit team discussions with the SDD development team, this issue has already

been identified and efforts are underway to develop a process to address prioritization and assignment of responsibility for closure of individual TBXs. This resulted in audit recommendation #5.

It was noted that the CRWMS M&O has several procedures that address the review and reporting of comments and their resolution in regard to technical documents and procedures. Many of these procedures require a different system of documenting this process, causing confusion and inconsistency. This resulted in audit recommendation #6.

The audit was accomplished through personnel interviews and a review of objective evidence. The audit team will inform the OQA Surveillance Lead that surveillances should be scheduled and conducted commensurate with SDD development stages.

The following technical references were examined during the audit:

Procedures

CRWMS M&O Quality Assurance Procedure (QAP)-3-0, *Design Control Process*, Revision 05.

Implementing Line Procedure, NLP-3-33, *System Description Documents*, Revision 2, June 19, 1998.

Regulations

10 CFR 60, *Disposal of High-Level Radioactive Wastes in Geologic Repositories*,

Requirements Documents

Canistered SNF Disposal Container System Description Document, BBA000000-01717-1705-00001, Revision 00.

Defense High Level Waste Disposal Container System Description Document, BBA000000-01717-1705-00002, Revision 00.

DOE SNF Disposal Container System Description Document, BBA000000-01717-1705-00003, Revision 00.

Uncanistered SNF Disposal Container System Description Document, BBA000000-01717-1705-00004, Revision 00.

Subsurface Ventilation System System Description Document, BCA000000-01717-1705-00016, Revision 00, ICN 01.

Controlled Design Assumptions Document, B000000000-01717-4600-00032, Revision 05, July 1998.

Monitored Geologic Repository Draft Disposability Interface Specification, B000000000-01717-00108, Revision 01, Draft D, August 1998.

Mined Geologic Disposal System Requirements Document, YMP/CM-0025, Revision 3, February 1998.

Engineered Barrier System Design Requirements Document, YMP/CM-0024, Revision 0, ICN 01.

Interface Control Document for U. S. DOE SNF to the MGDS for Mechanical and Envelope Interfaces, A000000000-01717-8100-00007, Revision 00, December 17, 1997.

Multi-Purpose Canister Subsystem Design Procurement Specification, DBG000000-01717-6300-00001, Revision 06.

Interoffice Correspondence

Interoffice Correspondence, April 16, 1998, LV.SA.DDO.04/98-030.

Interoffice Correspondence, May 14, 1998, LV.RSD.NEK.5/98-017.

Interoffice Correspondence, August 13, 1998, LV.WM&I.RGV.8/98-026.

Management Documents

Technical Management Implementation Plan, Draft A, December 9, 1997.

Strategic System Management Policy document.

Design Documents

Ventilation Needs During Construction, BCAJ000000-01717-0200-00001, Revision 00.

Source Term Generation and Shielding Analysis for the 21 and 12 PWR Waste Packages, BBAC000000-01717-0210-00001, Revision 00.

Draft Performance Confirmation Subsurface Facilities Design Analysis, BCAI000000-01717-0200-00004, Revision 00A.

Waste Emplacement System, BCA000000-01717-1705-00017, Revision 00.

Calculation, Source Term Generation and Shielding Analysis for the 21 and 12 PWR Waste Packages, BBAC000000-01717-0210-0210-00001, Revision 00

Repository Subsurface Waste Emplacement and Thermal Management Strategy, B000000000-01717-0200-00173, Revision 00

Engineering Change Request #E98-0060, Level III, *Initial Issue of Assembly Transfer SDD, Subsurface Facility SDD, Waste Retrieval SDD, and Performance Confirmation Emplacement Drift Monitoring SDD*.
Engineering Change Request #E98-0061, Level III, *Update the Mined Geologic Disposal System Architecture*.
Compliance Program Guidance Package, *MGDS Compliance Package for DHLW Disposal Container*, BBA000000-01717-5600-00002, Revision 00.

Compliance Program Guidance Package, *Subsurface ventilation System*, BCA000000-01717-5600-00001, Revision 00.
Mined Geologic Disposal Systems Description Document (SDD) Identification List, July 16, 1998, B00000000-01717-1705-00001, Revision 03
Waste Package Design Basis Events, BBA0000000-01717-0200-00037, Revision 00, CRWMS.
NLP-3-16 *TBV/TBD Descriptions* #TBV-240, TBV-094, TBV-096, TBV-245, TBD-161.

5.5 Summary of Conditions Adverse to Quality

The audit team identified one condition adverse to quality during the audit. However, no new OCRWM deficiency document will be issued for this condition. The corrective action for this condition will be addressed in the response to the previously issued deficiency document identified in Section 5.5.2 of this report.

5.5.1 Corrective Action Requests

None.

5.5.2 Deficiency Reports

DR VAMO-98-D-02

This DR, previously issued to the CRWMS M&O, describes adverse conditions relative to training records. An assessment by the CRWMS M&O managers is underway to correct training deficiencies. This DR has been revised to identify a noncompliance discovered during this audit with the training record file for one individual.

5.5.3 Performance Reports

None.

5.5.4 Conditions Adverse to Quality Corrected During the Audit

None.

6.0 RECOMMENDATIONS

The following recommendations resulted from the audit and are presented for the CRWMS M&O management consideration:

1. Management of technical processes (e.g., requirements flowdown, interface control,) is not described in any CRWMS M&O approved document. Interviews were conducted and a sample of typical design analyses was evaluated to confirm this observation. For example, in the area of requirements flowdown, in most cases, the designers were using SDDs as the criteria for their design analyses. However, there was one instance where the design organization used the VA technical baseline (i.e., *Repository Design Requirements Document*) as design criteria for the development of an analysis (*August 13, 1998, IOC LV.WM&I.RGV.8/98-026*). The audit team recommends that CRWMS M&O define, control, integrate, and approve these processes in a management plan such as the Technical Management Implementation Plan to support a consistent, traceable, transparent, and defensible design basis.
2. Selected SDD system design criteria were evaluated against requirements in the MGDS-RD and regulatory requirements in 10CFR60. No requirements were found to be missing in the sample. However, there does not appear to be any comprehensive method to verify that all 10CFR60 requirements have been adequately addressed. It is the audit team's understanding that a matrix was developed for VA and an equivalent cross-walk is scheduled to be developed for LA in FY 99. The audit team fully supports this intention and recommends that it be integrated with the Licensing organization.
3. Selected SDD design criteria were evaluated against assumptions in the CDA Document. It appears that no assumptions were missing. However; there is no structured method to verify that all of the CDA assumptions have been adequately addressed. The audit team recommends that a process to transition from CDA assumptions to SDD criteria statements (identified by the appropriate TBX listing, if needed) be developed.

4. A sample of SDD Volume II Criteria Basis Statements was evaluated. In most cases there appeared to be adequate basis for the requirements. There were several instances where documents were referenced. It is unclear whether these documents are appropriate as inputs in the Criteria Basis Statements. These documents include: *Interface Control Document for US DOE SNF to the MGDS for Mechanical and Envelope Interfaces* (e.g., *DHLW Disposal Container SDD*, Paragraph 1.2.1.2); *MPC Subsystem Design Procurement Specification* (e.g., *DHLW Disposal Container SDD*, Paragraph 1.2.1.13); *MGR Draft Disposability Interface Specification* (e.g., *Uncanistered SNF Disposal Container SDD*, Paragraph 1.2.1.2); *Engineered Barrier*.
5. *System Design Requirements Document* (e.g., *Uncanistered SNF Disposal Container SDD*, paragraphs 1.2.4.1, 1.2.4.2); *Controlled Design Assumptions Document* (e.g., *Uncanistered SNF Disposal Container SDD*, paragraphs 1.2.4.1, 1.2.4.2). These documents should be evaluated as appropriate inputs and their selection documented for the design.
6. There is presently no method to control the duplication (assignment of more than one TBX identifier to a single CDA assumption), prioritization, and assignment of responsibility for closure of TBXs. Currently, there are hundreds of TBXs identified. A prioritized list of TBXs that supports the resolution of LA technical issues has not been developed. The audit team recognizes that a Quality Assurance Procedure (QAP) is under development, and recommends expedient issuance of this procedure to support FY 99 revision of SDDs and future planning.
7. There are numerous CRWMS M&O procedures that describe the review and comment resolution process. The following are examples: NLP-3-31, *Review and Approval of Submittals*; NLP-3-33, *System Description Documents*; QAP-3-5, *Development of Technical Documents*; QAP-3-8, *Specifications*; QAP-3-9, *Design Analysis*; QAP-5.1, *Preparation of M&O Quality Assurance Program Documents*; etc. These procedures describe review and comment resolution processes that are all slightly different. It is recommended that one procedure be developed to standardize the review, reporting, and resolution of comments.

7.0 LIST OF ATTACHMENTS

Attachment 1: Personnel Contacted during the Audit
Attachment 2: Summary Table of Audit Results

ATTACHMENT 1 PERSONNEL CONTACTED DURING THE AUDIT

<u>Name</u>	<u>Organization/Title</u>	<u>Pre-Audit Meeting</u>	<u>Contacted During Audit</u>	<u>Post-Audit Meeting</u>
Alder, C.	OQA/QATSS Sr. QA Specialist	X	X	
Ashlock, K.	M&O/TRW Interface control	X		
Barnes, C.	OQA/QATSS Sr. QA Specialist		X	X
Bartley, N.	M&O/SE&I SDD Developer	X		
Benton, H.	M&O/Framatome		X	
Bhattacharyya, K.	M&O/MK		X	
Blaylock, J.	DOE/OQA Engineer			X
Chagnon, C.	M&O/Framatome		X	
Clark, J. K.	M&O/Deputy Assistant General Manager	X		X
Cruz, B.	M&O/TRW		X	
Dahl, P.	M&O/Beckman, Consultant R&L	X		
Demboski, E.	M&O/SE&I Systems Engineer	X		
Doering, T.	M&O/Framatome		X	
Elliott, S.	M&O/SE&I Developer	X		
Frankle, M.	M&O/FCF Engineer	X		X
Greene, H.	OQA/QATSS Manager QA Systems	X		X
Griffith, G.	M&O/Surface Engineering Manager	X	X	X
Justice, R.	M&O/EA Engineer	X		
McCann, E.	M&O/SE&I Originator	X		
Minwalla, H.	M&O/SE&I Supervisor	X		X
Opelski, E.	OQA/QATSS Lead QA Specialist	X		X
Orvis, D.	M&O/SA DBE Analysis	X		
Peters, J.	M&O/Manager Engineering Services	X	X	X
Saunders, R.	M&O/Engineering Subsurface Design	X	X	X
Schreiner, R.	M&O/EBSO Staff			X
Schwatztraubev, K.	M&O/Fluor Daniels		X	
Sellers, M.	M&O/SE&I Department Manager	X		
Stanbaugh, R.	M&O/SE&I MGDS Requirements Mgr.	X	X	X
Stroupe, E.	M&O/SE&I Manager	X	X	X
Sudan N.	M&O/SE&I SDD Originator	X		
Thom, B.	M&O/SE&I Supervisor	X	X	X

Legend:

OQA	Office of Quality Assurance
SDD	System Design Description
MGDS	Mind Geologic Disposal Site
EA	Engineering Assurance
DBE	Design Basis Event

**ATTACHMENT 2
SUMMARY TABLE OF AUDIT RESULTS**

SYSTEM DESIGN DESCRIPTIONS

Process Steps	Details (Checklist)	Deficiencies	Recommendations	Process Evaluation	Overall Effectiveness
Develop Criteria Basis Statements	Pgs. 1, 18, 25	None	#4	Satisfactory	EFFECTIVE
Requirements Flowdown	Pgs. 17, 20, 22, 23, 26, 27	None	#1, #2	Satisfactory	
Selection and Training of Personnel	Pgs. 2-3	VAMO-98-D-02		Satisfactory	
Selection of Inputs	Pgs. 17, 19, 20, 25, 27, 29	None	#3, #4	Satisfactory	
Initiation and Development of Type I Analysis	Pg. 29	None		Satisfactory	
Discipline Checking	Pgs. 5-7, 12	None		Satisfactory	
Review Process and Schedule	Pg. 24	None		Satisfactory	
Labeling of Criteria that are To Be Verified/To Be Determined	Pgs. 10, 11, 19, 21	None	#5	Satisfactory	
Comment Resolution	Pgs 12, 13	None	# 6	Satisfactory	
Revisions and Interim Changes	Pgs. 14, 18, 24	None		Satisfactory	
Records	Pgs 15	None		Satisfactory	
SYSTEM DESIGN DESCRIPTION PROCESS	Pgs 29	VAMO-98-D-02	6	Satisfactory	EFFECTIVE